WANL-TMI-1799

From : Engineering Mechanics
WIN :
Date : June 22, 1967
Subject : NR-1 Nut to Support Stem Seal Test

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The purpose of the NR-1 nut to support stem seal test was to evaluate the performance of the metal-to-metal seal shown in Figure 1. This configuration was proposed for use in the NR-1 plena. This 304 stainless steel seal was to be tested in a helium atmosphere under a 500 psid pressure gradient. Tests were conducted at ambient, cryogenic, and with a 600°R gradient across the seal interface.

The test fixture (WT701615) shown in Figure 2 was built to simulate the support stem configuration in the area of the seal. A 32 finish was requested on the seal interface of the seal jacket and nut. The seal was tested at 140°R, 530°R, and with a 450°R to 1050°R gradient across the seal. The gradient was established with the low pressure end in a furnace (Figure 3) while cooling the high pressure end in LN_2. Thermocouples to monitor the thermal gradient are shown in Figures 2 and 3.

The surface finish on the seal jacket was most difficult to inspect. No vendor could be found to inspect an unsectioned seal jacket at the seal interface. Therefore, one jacket not used in testing was sectioned near the metal seal interface and sent to Brush Instruments in Cleveland for inspection on a Surfanalyzer Model 150. The results of this surface finish inspection are illustrated in Figure 4. The top trace is a profile of the surface and shows two machining scratches. The lower trace indicates that the surface finish is between 20 and 24. Although only one jacket was sectioned and inspected it is reasonable to assume that all seal finishes on the jacket were approximately 20 - 24. The nut seal finish was inspected by WANL Quality Control to a 32 finish.

INFORMATION CATEGORY
Unclassified
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DISCLAIMER

The assemblies were tested at different torques and thread lubricants indicated in Figure 5. All assemblies with Nio-lube lubricants and a 200 inch pound torque on the nut/bolt assembly did not leak under any test conditions.

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Attachments (5)

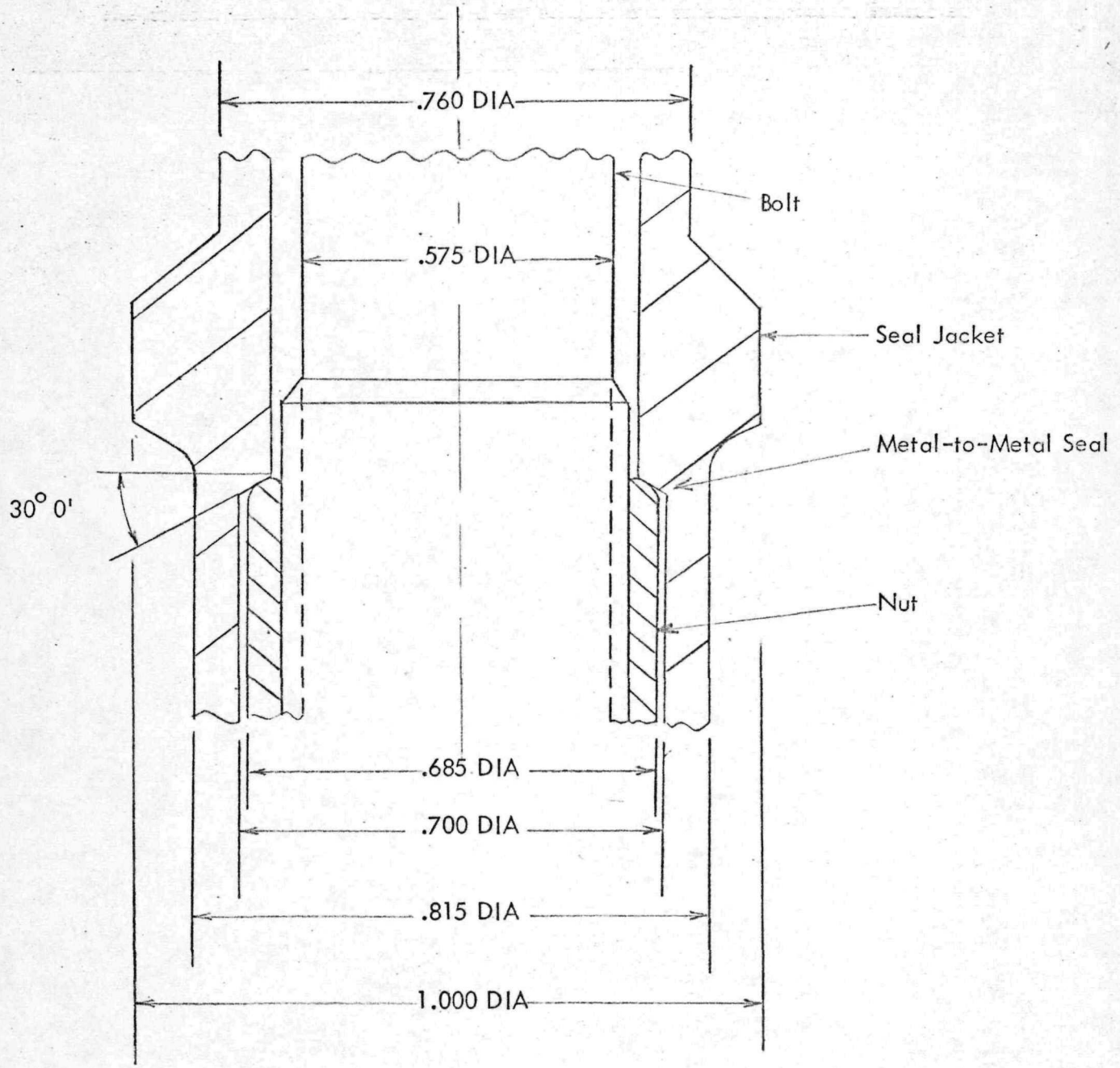

FIGURE 1

CROSS SECTION OF SEAL CONFIGURATION

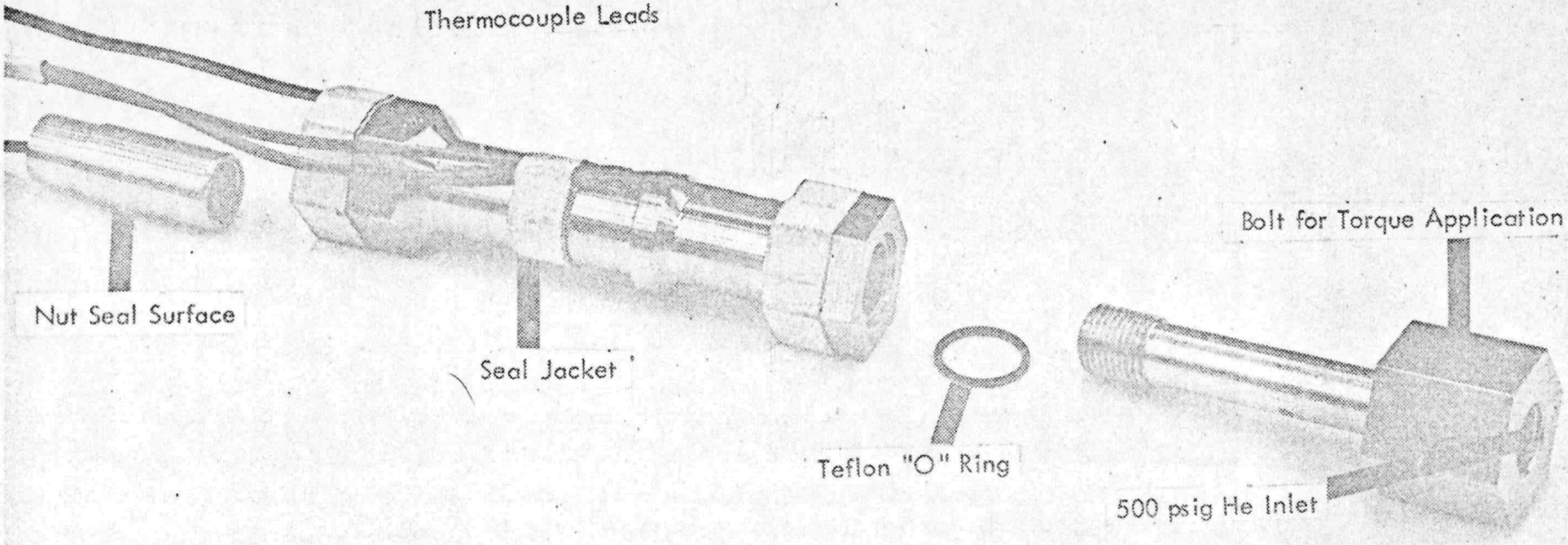

FIGURE 2

NUT TO TIE TUBE TEST
FIXTURE ASSEMBLY

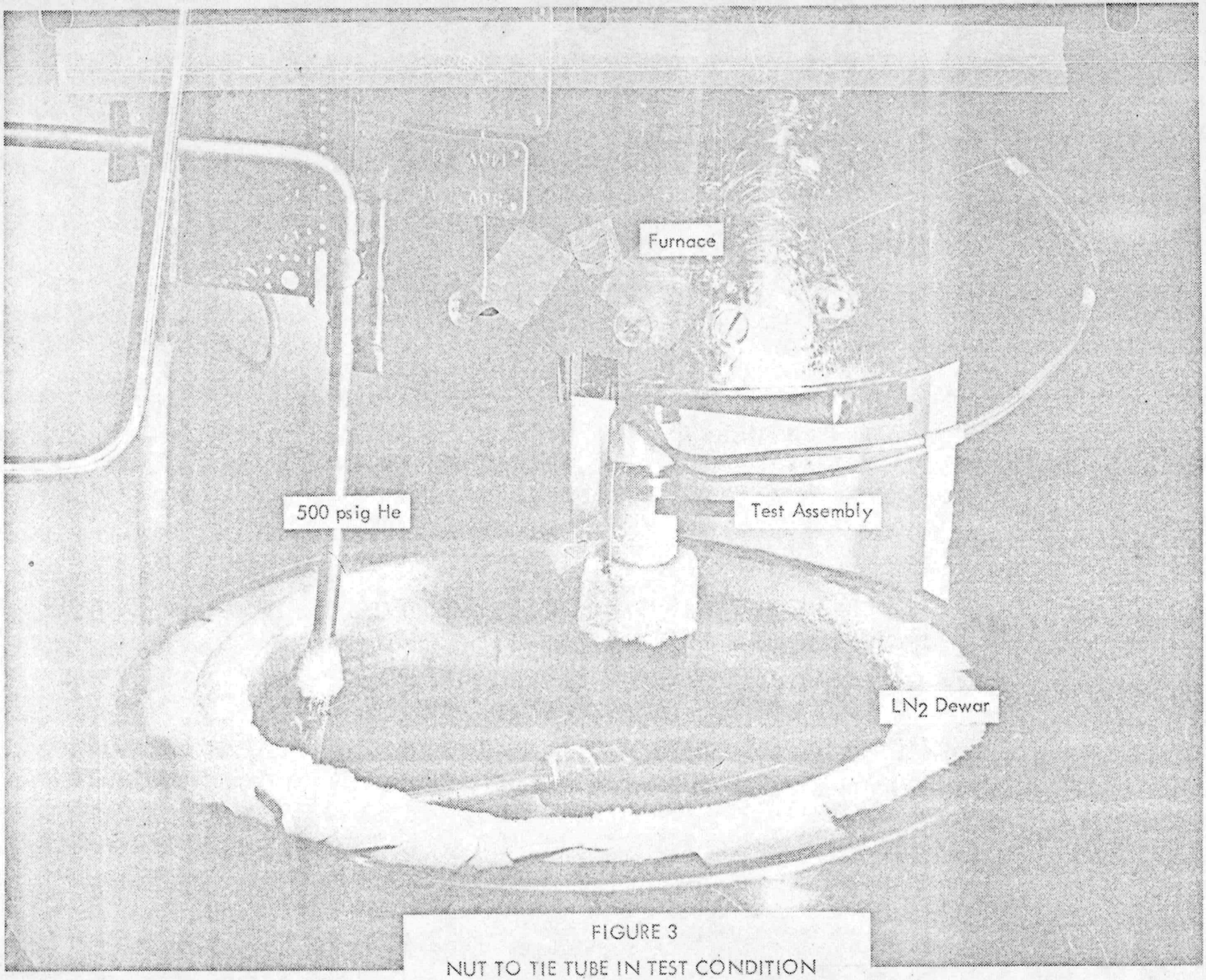

FIGURE 3

NUT TO TIE TUBE IN TEST CONDITION

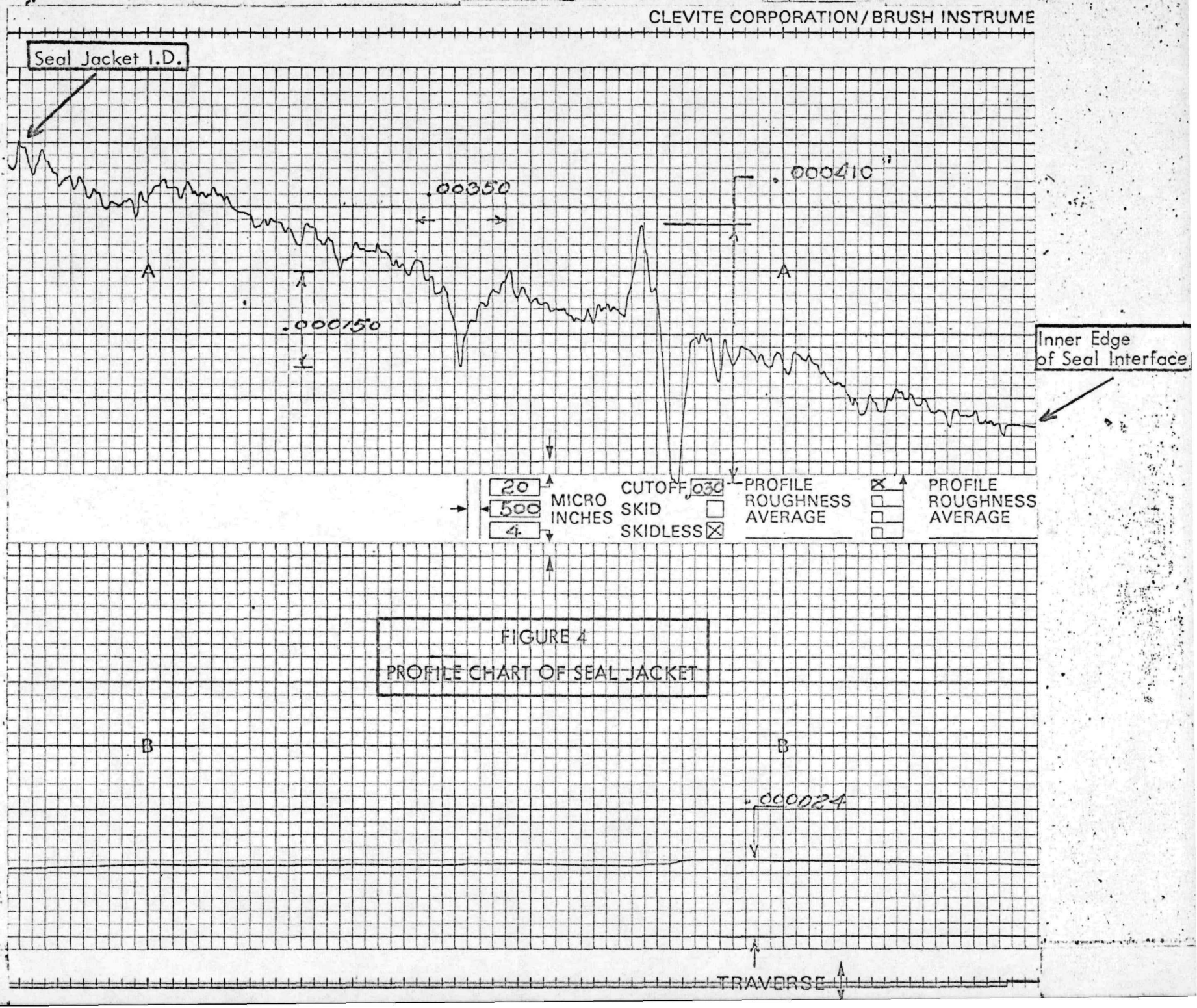

FIGURE 4
PROFILE CHART OF SEAL JACKET

FIGURE 5

Specimen Number	Torque in-lb	Hydrogen Leak Rate lbs/s x 10^{-6} 140°R ΔT=0	535°R ΔT=0	750°R ΔT=600°R	Thread Lubricant
1	200	----	.0093	.48	None
2	300	.024	0	0	None
3	100	.10	.0068	.0032	Molybdenum Disulfide
3	200*	.030	0	0	"
3	300*	0	0	0	"
4	100	0	0	.0087	Nio-Lube
4	200*	0	0	0	"
5	70	0	0	1.8	"
5	200*	0	0	0	"
5	200*	0	0	0	"
6	200*	0	0	0	"

* Specimen disassembled and then reassembled to the indicated torque